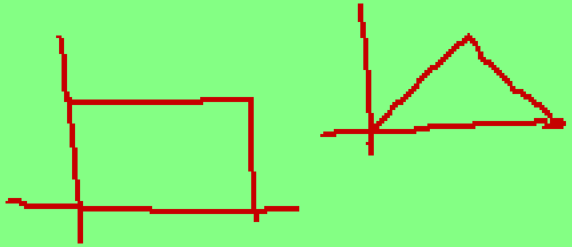
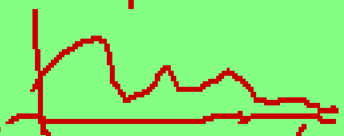
AP STAT: Section 1.3

Other Distributions (using mean and std. deviation)

Histogram/stemplot/etc.	**Density Curve**
• samples	• population
• actual observations	• show overall/general pattern
• different graphs	• smooth curve
• calculate:	• relative freq. (%)
$\bar{x}$, s } sample	• area under curve = 1 = 100%
$N(\mu, \sigma)$	
$N(75, 7)$	

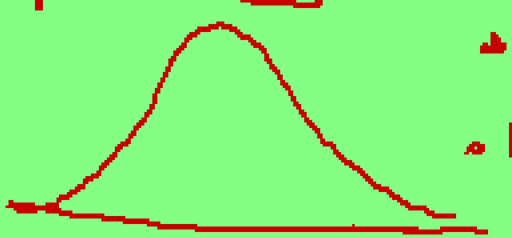
• different forms





Specific Density Curve:

* NORMAL CURVE (or DISTRIBUTION)



• symmetric

• bell-shaped

mounded

• unimodal

Ex: ht, weights, test scores

Empirical Rule

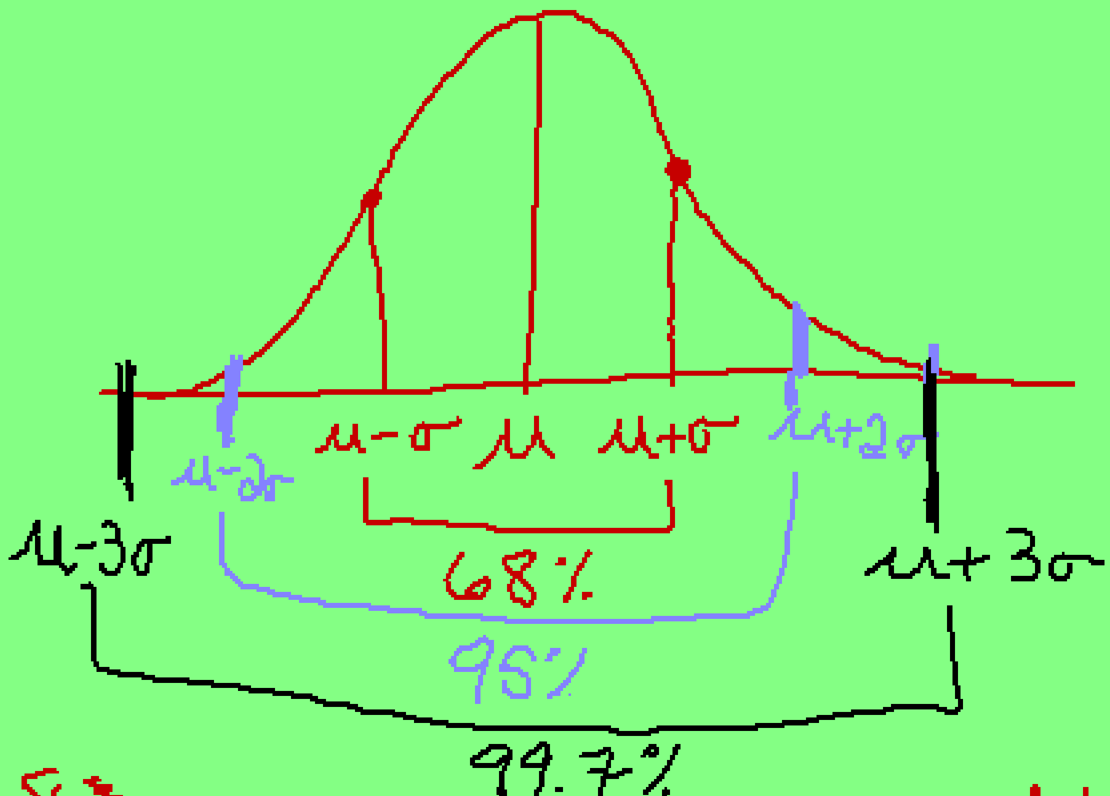
In a normal distribution with N(μ, σ)….

N(15, 3)

(12, 18)

(9, 21)

(15, 18)



- 68 % of the observations fall within $\mu \pm \sigma$
- 95 % of the observations fall within $\mu \pm 2\sigma$
- 99.7 % of the observations fall within $\mu \pm 3\sigma$

Example:

The avg. time that it takes a crew from Sweeper Sam to clean a room is normally distributed with a mean of 2.1 hrs and a standard deviation of 0.3 hrs.

N(2.1, 0.3)

a) The total clean up time will fall within what interval 95% of the time?

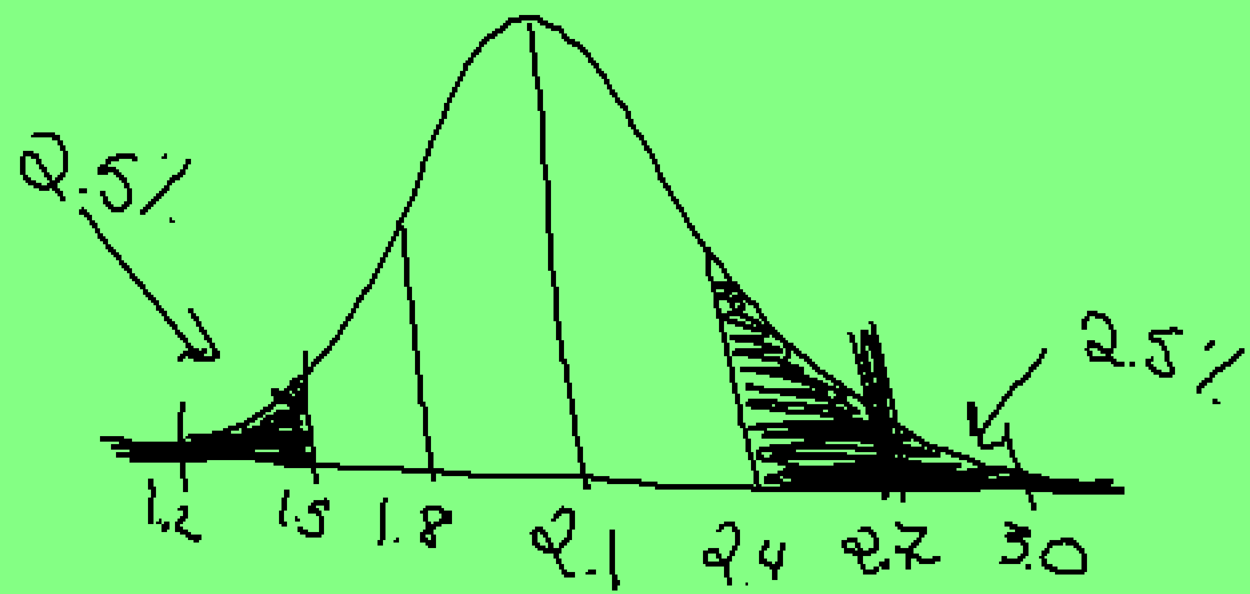
(1.5, 2.7) hrs. $\pm 2\sigma$

b) What proportion of the time will it take the crew [redacted] hours or more?

change to 2.4 hrs: 16%

c) What percent of the time will it take the crew 1.5 hrs or less?

2.5%



Standardizing Observations

1) You are in a history class and a math class. You take your chapter 1 test in both classes on the same day, and get them both back a few days later. Your grades are as follows. Which class did you do better in?

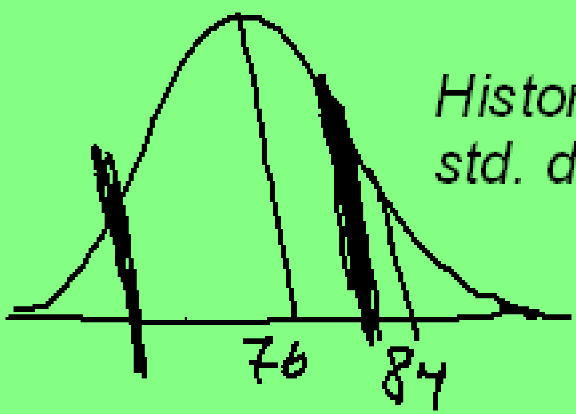
   History: 81% *Math: 75%*

2) Same scenario. However, each teacher tells you a bit about how your class did. Which class did you do better in?

   History: 81% > 5%
   mean: 76%

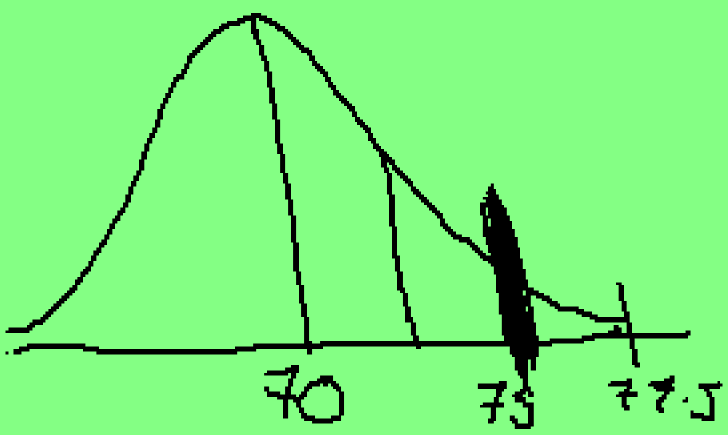
   Math: 75% > 5%
   mean:70%

3) Same scenario. However how your teacher gives you the class standard deviations. Which class did you do better in?



   History:
   std. dev: 8%

   Math:
   std. dev:2.5%



Standardizing Observations

Question: *How can we compare one distribution to another distribution if they don't have the same parameters (mean and std. dev)?*

Answer: compare the obs. to its own μ and σ

To standardize:

- *measure observations….* in terms of how many σ they are above/below their μ
- Z = z-score

$$Z = \frac{x-\mu}{\sigma} = 2\sigma$$

Hist:

- *Z- score tells us…* how many σ an observation is above/below its μ.

$Z = -1.3\sigma$ $Z = 1.3\sigma$

$$Z = \frac{81-76}{8} = 0.625\sigma$$

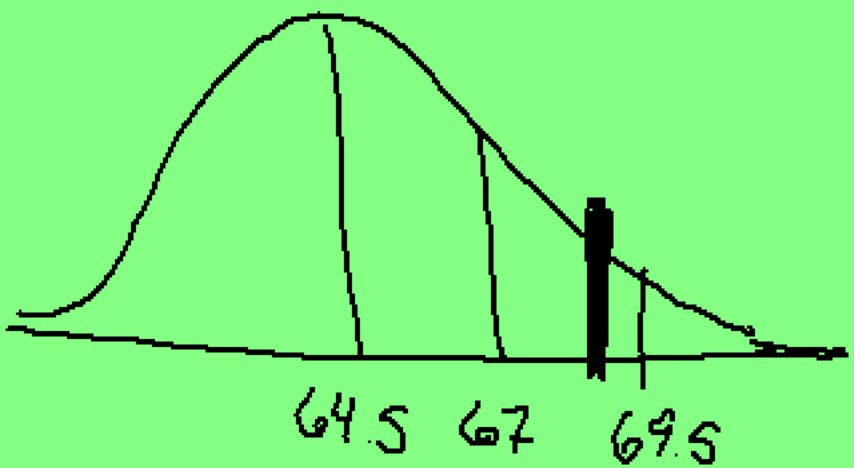
Example: *The heights of 18-24 year old women are normally distributed with the following:*

mean = 64.5" *and* *std. dev = 2.5"*

$N(64.5, 2.5)$

We know a woman who is 69" tall. How does she compare to the rest of the women in her age group? Calculate her z score, and interpret what it means.

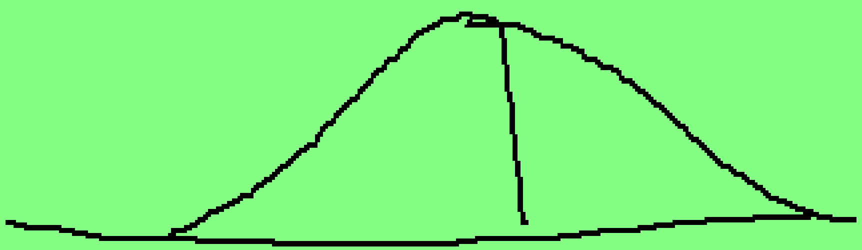
$$z = \frac{x - \mu}{\sigma} = \frac{69 - 64.5}{2.5} = 1.8\sigma$$



Men: 72"

$N(67, 2.1)$

$$z = \frac{72 - 67}{2.1} = 2.38\sigma$$



Notes on Standardizing a distribution:

- *Standardizing one observation…* comparing to its mean
- *But we can also standardize…* whole distribution

- *But what does this do to the shape of the distribution?* Same

$$z = \frac{70-70}{2.5} =$$

- *Standardizing is actually just…* manipulating

$-\mu \qquad \times \frac{1}{\sigma}$

- *When we do this we have a new distribution, called:* Standard Normal Distrib.

- *Table A in the book*
  - *Gives:*
  - *So, the area to the left of the z-score represents…*

Back to the height example….

Remember that the heights of 18-24 year old women are N(64.5”, 2.5”). What percentile is the girl who is 68” tall?

What percent of 18-24 year old women are less than 5 feet tall?

What percent 18-24 year old of women are over 5'8” tall?

*** **PROBABILITY NOTATION!!***

Another example:

Blood pressures of high school students are N(170, 30). What is the probability that a randomly selected high school student has a blood pressure of 180 or above?

Using the same data as above, what is the probability that a high school student has a blood pressure between 160 and 230?

Using the same data as above, what blood pressure has 25% of the bobservations below it?

Calculator use:

To find the percent of observations between 2 points:

To find what observation has a certain percent of the data below it:

On the calculator, infinity is: